filling the gaps

Climate and Weather Information for Small- and Medium-size Water Utilities

Helping Water Utilities Plan and Design for a Changing Climate in the Pacific Northwest

Science and Trends

The Pacific Northwest region warmed by about 1.8°F since 1895[1] and is projected to rise from 2 to 8 degrees by the end of the 21st century[2]. Models also show a clear trend towards heavier peak rain events in the future, and the heaviest daily rain events are projected to be 22% more intense, on average, by the 2080s[3]. Snowpack has declined by about 25% since the mid-20th century[4], and is projected to decline up to 70% by the 2080s compared to the 1980s[5]. Sea level has risen by about 8 inches at the Seattle tide gauge. Regionally, sea level is projected to rise an additional 1.5-2 feet, on average, by the end of the century[6].

1 WA State Climate Office, 2020. PNW Temperature, Precipitation, and SWE Trend Analysis Tool.
2 Snover, A.K. et al., 2013. Climate Change Impacts and Adaptation in Washington State: Technical Summaries for Decision Makers.
3 Warner, M. D. et al., 2015. Journal of Hydrometeorology. doi: 10.1175/JHM-D-14-0080.1
4 Stoelinga, M.T. et al., 2009. Journal of Climate. doi: 10.1175/2009JCLI2911.1
5 Elsner, M. M. et al., 2010. Climatic Change doi: 10.1007/s10584-010-9855-0
6 Miller, I.M. et al., 2018. Projected Sea Level Rise for Washington State – A 2018 Assessment.

Purpose of the Workshop Series

This workshop series was designed by NOAA and the Water Research Foundation to improve its delivery of information resources for small- and medium- size water utilities useful for building their resilience to a changing climate. Each workshop was organized by NOAA's regional partners and addressed issues identified by and for each region. The workshops offered a forum for exchanging ideas to:

- Identify gaps and improve NOAA climate and weather-related tools and information resources;
- Provide timely and relevant weather and climate information and raise regional-scale awareness of NOAA tools and resources;
- Build regional connections that support small-scale utility decision making; and
- Develop improved communication materials and enhance NOAA's tools for local decision making.

The Pacific Northwest Workshop

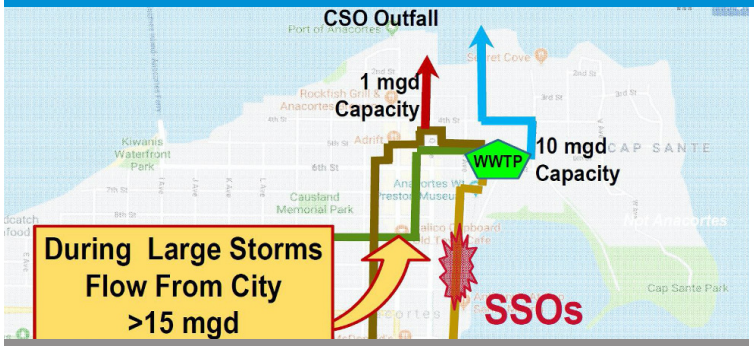
The Climate Impacts Group and the University of Minnesota conducted a pre-workshop survey and focus groups of prospective attendees and found highest interest in case studies from peers describing how they incorporated climate change in planning and design. Climate change topics of greatest interest were drought, changing snowpack, extreme precipitation, and flooding. As a result, this workshop was presented in three webinars focused on extreme precipitation, drought, and flooding. The webinars profiled regional case studies and included breakout group discussions and introductions to relevant data, tools, and resources. Three case studies demonstrated, respectively, best practices for adaptation, how adaptation was put into action in a smaller utility, and how to determine thresholds for facility design.

A poll of participants about their use and interest in different regional data tools indicated that the Climate Toolbox was new to almost half of attendees and almost all said they were very likely or somewhat likely to use the tool in the future. Most also said they were likely to use the U.S. Climate Resilience Toolkit, and three quarters were likely to use the Water Resources Dashboard. A post workshop survey indicated that all of those who responded were interested in attending similar webinars in the future.

Workshop Date :: August 2020

Case Studies

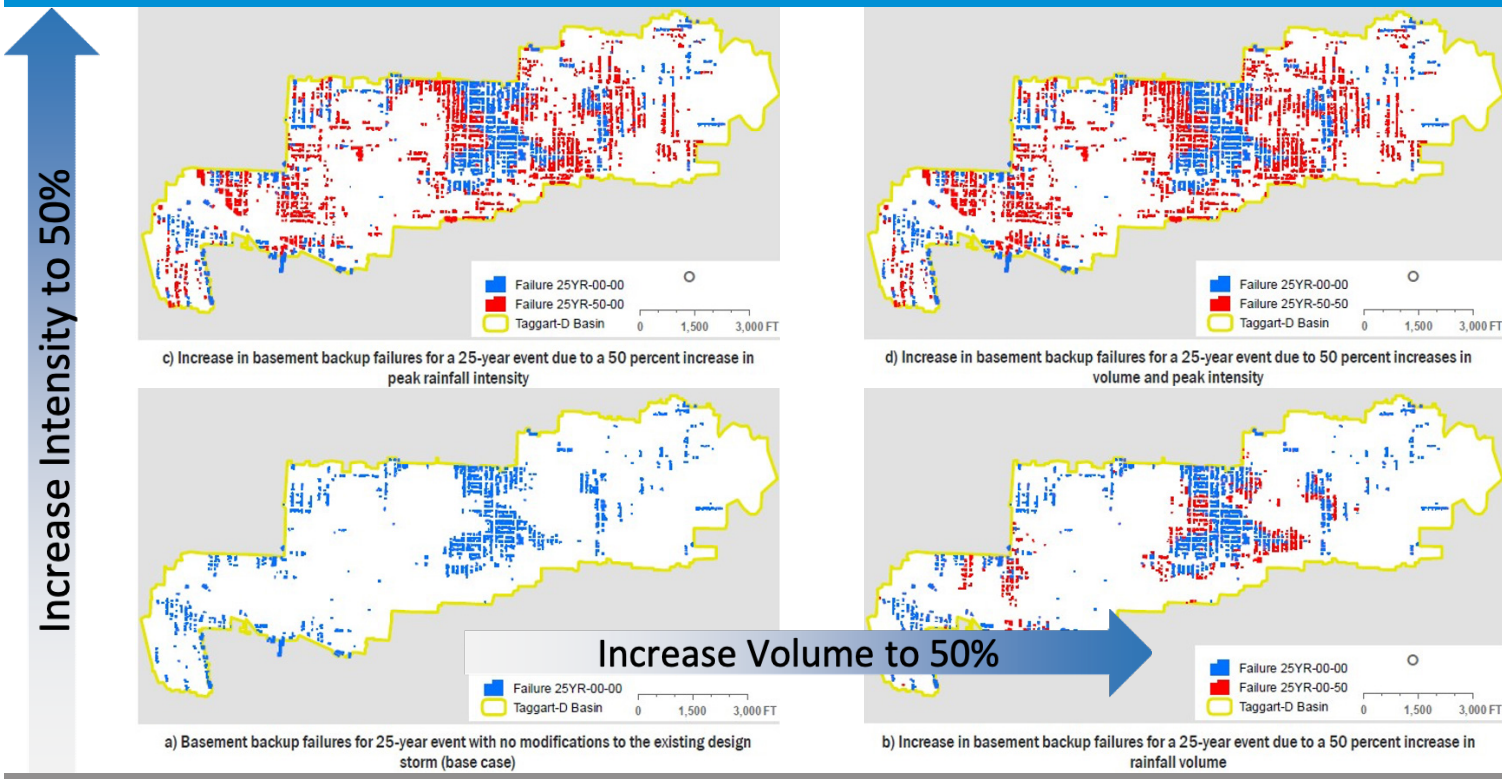
Climate Adaptation in Public Works (Fred Buckenmeyer, Director, City of Anacortes Public Works). When the Director of Public Works attended a climate change workshop in 2009, his eyes were opened to risks to the City's water supply as well as to the efficacy of its wastewater and stormwater systems. Established trust in the Public Works office, and the fortuitous timing of the climate workshop during the scoping phase, enabled the Public Works department to adapt the design of their new water treatment plant to account for climate change.



Anacortes, Washington
Stormwater flow during large storms

Anacortes, WA Water Treatment Plant
Watertight Construction

Throw Away Your Crystal Ball: A Stress Testing Approach to Infrastructure Planning Under Climate Change Uncertainty (Nishant Parulekar, Civil Engineer, City of Portland, Bureau of Environmental Services). Given the numerous different climate projections available and the complexities associated with their interpretation, Portland decided to take a different approach to assess their vulnerability to projected changes in precipitation. Their novel sensitivity analysis provides a basis for evaluating localized risk and conducting cost/benefit studies to prioritize investments.



Sensitivity Analysis of Stormwater System, Portland Bureau of Environmental Services, 2020

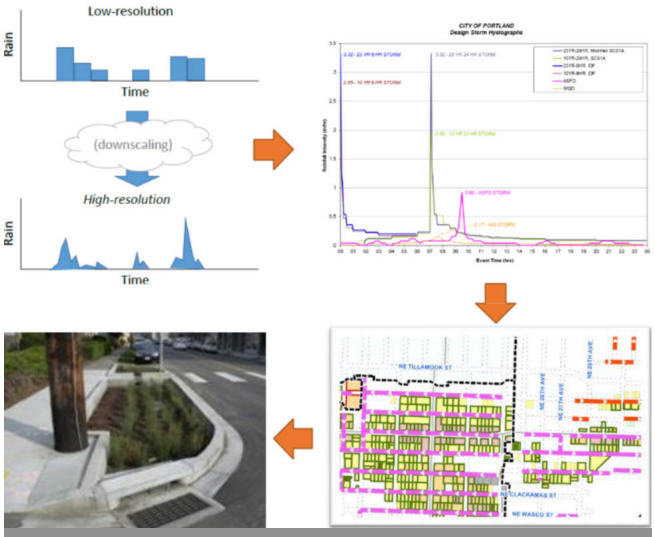
Lessons Learned

Survey, focus group, and webinar participants emphasized the value of learning from their peers. Seeing what others have done in practice helps to center climate solutions on their area of expertise, while also clarifying how climate information has been used by others.

Assumptions about design storms are significant. In Portland, with a variety of microclimates, analysis found that use of a single design storm led to errors of over 10% for some storms and locations, implying that different sets of design storms were needed for different parts of the city.

Sensitivity analyses provide a basis for evaluating localized risk and conducting cost-benefit studies to prioritize investments. A quantitative approach that varies intensity and volume of precipitation allows planners to play with design storms to understand risk.

The scoping phase of new or upgraded infrastructure is the opportune time to conduct a thorough analysis of climate change risks. Leveraging others' climate analyses and partnering with the academic and engineering communities to conduct long range analyses helps to bound designing for future risks.



Testing downscaled models for system design, Portland, OR | Nishant Parulekar

Pre-workshop focus groups revealed:

- Water utilities have limited expertise and technical capacity to use climate change information.
- There is insufficient data available at relevant time-scales and time-steps.
- Silos within organizations hinder information flow across units where climate change information could be used or incorporated to build resilience.
- Climate adaptation is perceived to be costly, and there is little funding to support adaptation.
- Climate change is a controversial and political topic, making it challenging to communicate with both internal and external audiences.
- State and federal regulations are often rigid, making it hard to alter management practices in ways that would build resilience to different climate impacts.

SCAN ME

› NOAA Workshop Series Website

› PNW Workshop Website

Tools Demonstrated:

› Climate Toolbox

› Water Resources Dashboard

› Climate Resilience Toolkit

› EPA Creating Resilient Water Utilities

› Aspen Global Change Institute Mountain West Climate Services Partnership

› WUCA Online

› Leading Practices Guide

› Engineering Case Studies

› DOs and DON'Ts for Using Climate Change Information for Water Resource Planning and Management

Five Core Leading Practice Action Areas for Climate Change Adaptation

Leaders **Engage** in climate change adaptation, motivating action, engaging and supporting others, and developing climate messages

Leaders work to **Understand** climate science, their system, and their system's vulnerabilities, risks, and opportunities

Leaders **Plan** by building capacity and planning for multiple futures

Leaders **Sustain** action, including monitoring conditions, developing funding, maintaining capacity, and managing expectations

Leaders **Implement** changes in their assets and their actions

Julie Vano, Water Utility Climate Alliance

Information Needs

- ☐ Simplified information – practitioners are overwhelmed by the sheer amount of data and are unsure how to use information when prioritizing actions. A regional climate change information "clearinghouse" would facilitate uptake of information.
- ☐ Actionable information and compelling graphics – information needs to be in a form that can be communicated to decision makers to build buy-in and to increase chances of securing funds.
- ☐ Tools, resources, and case studies – specifically aimed at helping utilities use climate change information. Growing a community of practice can help make information transferable across organizations.
- ☐ Training – integrating climate change content into existing trainings and professional development opportunities that are already a go-to and trusted source for water managers.
- ☐ Information on financing adaptation – including training on how to weave diverse funding sources together to support climate change adaptation in the water sector.

Next Steps

The University of Washington Climate Impacts Group and the University of Minnesota are considering some next steps following this webinar series such as:

1. Explore the opportunity of using the annual Northwest Water Year Workshop as another avenue to continue to engage with small- to medium-sized utilities.
2. Work with WRF, NOAA, WUCA, and others to develop resources beyond climate science data and information, including developing content to promote WUCA's Leading Practices.
3. Develop additional webinars on topics such as financing and grants for adaptation, internal and external communications, and climate impacts (e.g. drought, wildfire, sea level rise), and to showcase the Leading Practices in action.
4. Engage more deeply with boundary organizations and consultants in the water sector and build partnerships with utilities in need of technical support or information.
5. Develop trainings and facilitate peer learning networks to build capacity for climate adaptation among water utility staff.
6. Engage in regional conversations about NOAA Atlas14 and the equity issues that result from its omission for the Northwest region.

Organized by

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